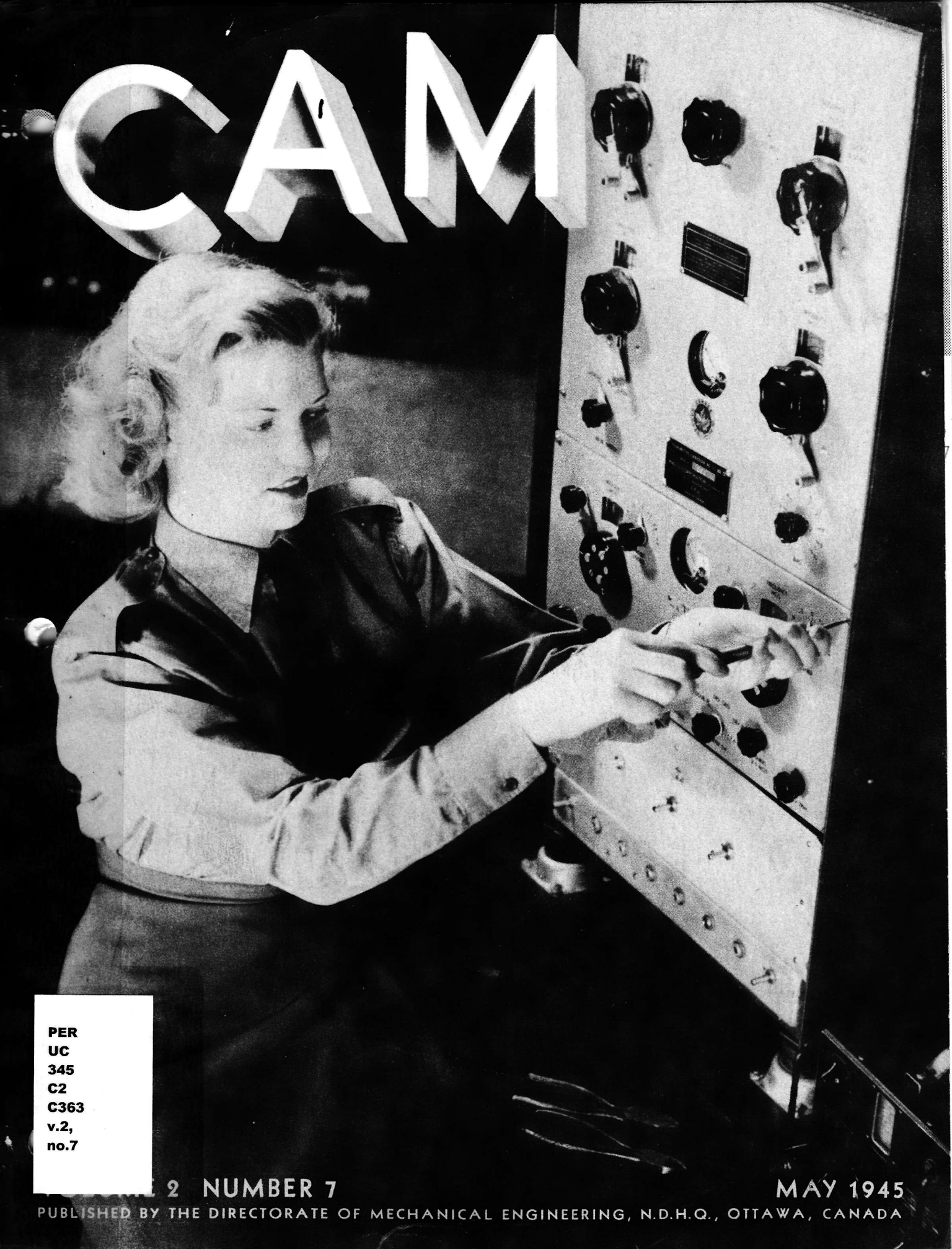
CAM



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TELS

TELECOMMUNICATIONS: a modern word to cover a multitude of things like Wireless Sets, Radio Sets, Radar, Telephones and Line Equipments, Mine Detectors, Movie Picture Projectors, Public Address Systems, Electronic door openings, in fact, anything that uses radio tubes and quite a few equipments that don't.

To say that the army wouldn't get along very well without 'Tels' is putting it mildly. Its busy wires and waves web their way through an army like veins—electronic veins perhaps, but none the less vital in supplying the means of flow for information and direction between the headquarters heart and the farthest reaching digits probing the enemy.

In addition to this vast network of Wireless and Line Equipments, and still a part of 'Tels', are the little units of equipment working independently at specific jobs. With the aid of 'Tels', the engineer locates and clears a path of safety through the deadly mine fields. With 'Tels', the artillery man pin-points a dangerous enemy counter weapon. With 'Tels' the projectionist can provide training through the most receptive of your senses—the eye, or provide the entertainment of a movie to relax the weary nerves. 'Tel's' persuasive voice of propaganda reaches in behind the enemy's front. 'Tels' amplifies the authoritative voice for all those in the newly occupied village to hear—and heed.

Behind all this, the men responsible for the function of Telecommunications go their mysterious and circuitous way. To the layman, the 'Tels' mechanic, with his test meters, spidery diagrams and obscure vocabulary is a member of some mysterious cult, dealing in theories and unknown quantities, yet producing results in fact.

He's perhaps a man apart—but most definitely a part of the highly technical and scientific business of winning a war.

That's good reason why CAM is regularly going to bring 'Tels' into its columns—perhaps to slightly lift the veil on some basic, but debated, theory—perhaps just whet the appetite of 'Tels' mechanics to probe deeper yet into their chosen trade.

No more may we be chided by those who claim we've left them to their own electronic devices.

CAM

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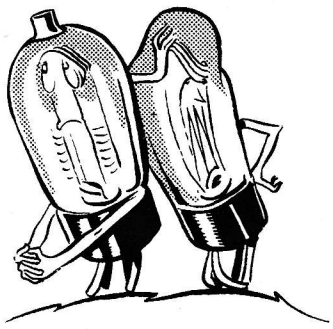
RADIO VALVES

Why are you blue?



FOR the sake of this story, Shorty Sirkit got into an argument with Emer Gency over the glass bulbs with all the gadgets inside.

"Look here, Emer, take a look at this one. All the inside is black and blue and it looks as though the dumdum who made it let some silver spill inside. You can't tell me that's good."

"Yes, I can," says Emer, falling for the bait like a ton of volts, "that's good; in fact, darn good!"

"Lissen, Emer, old pal, suppose you give us the lowdown on these bottles."

"I'm glad you called them bottles, Shorty, 'cause if ever hard-working guys got called so many names, it's these lads. Valves, tubes, bottles, acorns, peanuts and whatnot, lots of real harsh names at times, too, and most of the time through no fault of his'n."

"However, in the Canadian Army the proper name is *valve*, even though most of our boys have been brought up on the name *tube*. You see, 'way back when valves were hard to get, most of the equipment for the Canadian Army was bought in England, and to keep the boys in Ordnance straight, the term *valve* was inscribed on the books, and you know how hard it is to get your name rubbed off Part II Orders when the C.O. says "10 days or 10 days' pay". Course there's no law to stop you from calling it any pet name you like, and if you like the name *tube*, 'sOK but when you order one from Stores, be sure to ask for a *valve*."

"Now about those black looking valves, it's like this: During manufacture of radio valves it's necessary to suck out all the air in the glass envelope. The ideal valve would be one in which not one particle of air remained, and since air is composed of gases—hydrogen, oxygen, nitrogen, etc. —each gas being made up of small clusters of electrons, what they try to do is to remove every gas cluster. Some of the gases are locked in the metal parts inside the valve and have to be driven out. Even then, some gas clusters are so obstinate that they just won't leave."

"The manufacturer, knowing all the tricks, gives all the metal parts the hot-foot (some even get pretty close to the melting-point) and then gives them a shot of high voltage, so that by the time this 'baking' process is over, very few gas clusters are left in the glass bulb. Now some valves (not all) get real excited during this baking process, and the surface of the filament gets so hot that the metal turns to vapour. These vapours condense on the inside walls of the glass bulb and discolour it, some blue, some black and silver, or a mixture of all three.

"Even with all this sucking of air and baking of parts, including the glass bulb, some gas clusters just ignore their notice to move, so the manufacturer installs a gadget inside the tube called a 'getter', (sometimes a small piece of magnesium) that blows up when the vacuum and temperature inside the bulb are just right. This chases out nearly all the straggling gas clusters, and allows the electrons to move about with as little interference as possible."

"Now don't throw away valves that are not black looking. All valves don't need the treatment just mentioned, and even after all the gas clusters are removed, the manufacturer gives some valves a sip of mercury, or a shot of special gas to produce special effects in operation."

"Of course there is a lot more than this to the manufacture of radio valves, but getting rid of these annoying gas clusters is a real battle, during which time the inside of the glass bulb takes quite a beating."

"Thus accounting for its black and blue appearance no doubt", murmured Shorty on his way out.

X Y Z

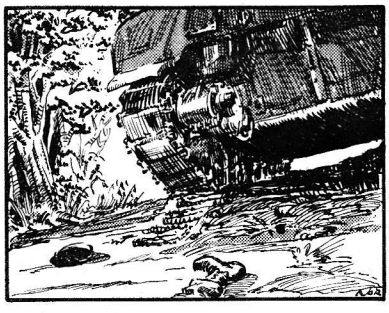
BEWARE of the TANK

CANADIAN ARMY PHOTO

. . . . cultivate a healthy respect for these monsters and you'll live to a ripe old age.

THE average bundle of skin and bones that is Tom, Dick or Harry tips the scales around 150 pounds. The fully equipped mass of armour plate that is the medium tank weighs in at around the 67,000 pound mark. So—when the smaller partner in this duo starts playing fast and loose with the respect due the big boy, someone always gets hurt—and at those weights, need we say who?

Take Tom. He knew the rules and was as good an engine man as ever P.M.'d a mag—till he got careless. Once, after finishing what he was doing inside the turret he remembered he had left his cap on the ground at the rear of the tank. Just as he slipped down the back to retrieve the all important cap, the driver decided to move the old girl ahead a few feet. The tank lurched forward—Tom lurched backward. Maybe it would have been funny if it wasn't for the fact that he landed on his head and broke his neck. After that the rest of Tom's crew never forgot to mount and dismount over the *front slope plate*, always in plain view of the driver. From that sad day on they observed the rule about riding on the outside of the hull, too. They know how easy it is to get "bumped off" and the danger of loose clothing becoming entangled in the sprocket or track.



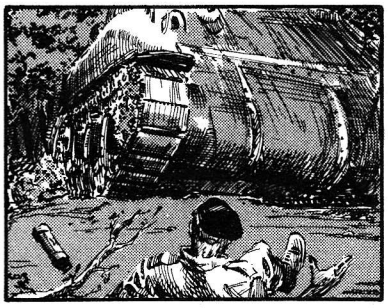
Then there was Dick, a guy who had a yen for fresh air. His favourite stunt was to sit on the edge of the turret, feet dangling inside the hull. At least it was —until a passing tree branch gave him the brush off. He was lucky though and got away with a busted collar bone. Three months later he was back in the same turret—and when we say **in** we mean inside.

Yet Dick, lover of nature that he was, couldn't take a hint and got careless the second time. When he broke his collar bone he learned that one should never ride a tank with one's hips above the hull. This time he learned that one should never hang on to

the edge of the turret opening or have one's head up too high. What actually happened was, the turret cover was knocked closed by another branch—maybe it was the same branch, we aren't sure. But the fact remains, when it crashed closed it nipped off several of Dick's fingers and also bashed in the top of his noodle. He's living—but learning the hard way.

But wipe away your tears—we haven't told you about Harry. Harry was acting as ground guide one day for his driver. They were both to blame but Harry got the worst of the deal—in fact he got the works. There he was, walking backwards guiding th tank. Even as you or I, he didn't

have eyes in back of his head, only in front. When Harry tripped the tank was only about five feet away. When it was finally stopped Harry was under the left hand track. That's a pretty high price to pay to learn that a tank guide should **always** face in the direction he is walking* and the driver should never be in anything but first or reverse gear, nor allow his tank to get closer than ten feet to the guide. Guides are important—too important to kill.



They must be used when a tank is navigated in close quarters and the guide is responsible for any damage done to people or things while he is guiding the tank.

Of course it is up to the driver to keep his guide in sight. If for any reason he loses sight of the guide he should stop right then and there. At night, if he is being guided by a man carrying a light, he mustn't move an inch if he can't see the light. If he does and the guide has fallen—maybe the guide will never see any kind of a light again.

Maybe we should stop telling you about all these unhappy endings, after all, we've knocked off two nice guys already and discharged another minus his fingers. We aren't going to stop yet though—not till we tell you about a few more things that can and have caused gory results.

There's the "Case of the Dead Platoon" for example. The men were very much alive as they marched along the roadside till a tank whizzed by at unchecked

speed. Fate dealt a wicked blow. The track broke at just the wrong moment and thirty odd tons of steel mowed the men down. Who was to blame? The driver in this case, because if he had used common sense he would have slowed his tank to a walk while passing the troops. He should have remembered that tank tracks sometimes give out at the wrong time and it's also possible for the steering band to lock suddenly, causing the tank to go careening off to one side or the other.

We could relate stories about many who have had more than a slight case of burning ears when they got careless and smoked too close to a tank. You've got to try it to know just how hot a fire can result from a lighted cigarette plus a quantity of hi-octane fuel. We were told of some bird who was blown right out of the turret. The explosion was caused by arcing when the main switch was closed after the fighting compartment had been cleaned with—yeah, gasoline! And speaking of the fuel used in tank engines—when it burns it gives off carbon-monoxide aplenty, even more than ordinary gasoline. You know what carbon-monoxide is. It's that deadly poisonous gas, slightly lighter than air, tasteless, odorless and you can't see it. Operating a tank engine in a closed or poorly ventilated building is strictly taboo. If it doesn't knock you out on the first time, your system will absorb it and store it up. It can get you on the instalment plan—then finally you cash in and are carried off.

To end up our story we'll tell you of another actual case where the weight of a tank spelled 'finis' for three 'used to be' healthy soldiers. At least the fellow who told it to us said it was true.

Stopping for the night these three unfortunates rolled up under the hull to keep out of the rain. While they slept, the weight of the tank caused it to sink lower in the ground. When the tank was pulled off them in the morning —No—let's just leave it by saying —never park your carcass under a tank hull and go to sleep.

Tom, Dick and Harry knew all these things—but they got careless and forgot. Tanks, like elephants, never forget and they'll go right on bumping off guys who do.

x y z

13 SAFETY POINTS TO REMEMBER

1. Always mount and dismount over the front slope plate.
2. Never ride on the outside of the tank.
3. When riding the turret, watch the cover to prevent it being slammed shut on your head or fingers.
4. Open the doors of the building if the tank is run over a minute indoors.
5. Always furnish a ground guide for moving a tank in or around buildings, and see that the tank is moved only in first or reverse gear. Never come nearer than ten feet to the guide.
6. Guides should face in the direction they wish to move.
7. Slow down when passing through dismounted personnel.
8. Smoking in or near a tank is strictly prohibited.
9. When riding the turret, keep your hips below the top and drop down inside the tank when crossing obstacles or through woods.
10. Wear a helmet when in a tank, and be sure there are no loose tools or equipment in the tank.
11. Never backtrack through woods.
12. When following a guide at night, stop if his light can no longer be seen.
13. Never sleep under a tank.

** This golden rule applies particularly to field operations—close maneuvering within the confines of a shop may make it necessary to face the tank.*

THE accurate calibration of Radios, Signal Generators, Wavemeters, etc. has frequently caused lines of worry in the usually serene features of our junior tels mechs. How often have they listened attentively, perhaps disinterestedly, to that persistent little canary whistling merrily away here and there on the popular short wave frequency band. But wait a minute. That canary is just the bird to remove your lines of worry.

The National Bureau of Standards, through the regular transmission of standard frequencies from its station WWV, effectively places the national primary radio-frequency standard at the disposal of every laboratory and shop in this country and in many other parts of the world.

WWV exists exclusively for the purpose of disseminating standard frequencies. The station, located at Beltsville, Md., near Washington, D.C., achieves nation-wide coverage by employing four carrier frequencies. Carrier power at each frequency is 10 kilowatts.

Two of the standard frequency transmissions are made day and night, one throughout the night, and the remaining one through the day. Here's the schedule:

2.5 Mc. 19 00 hrs. to 09 00 hrs. EWT (2300 to 1300 GMT).
5 Mc. Broadcast continuously day and night.
10 Mc. Broadcast continuously day and night.
15 Mc. 07 00 hrs. to 19 00 hrs. EWT (1100 to 2300 GMT).
(The times given are those at Washington, D.C.)

In addition to the standard radio frequencies, represented by the four carriers, there are also two standard audio frequencies (440 and 4000 cycles per second being employed simultaneously to modulate the 5-, 10-, and 15-megacycle carriers, and 440 cycles only to modulate the 2.5-Mc. carrier) and a standard time pulse, heard on the air as a faint tick. The latter is of 0.005 second (5 milliseconds) duration, consists of five cycles (each 1 millisecond in duration), appears upon each of the carriers, and is a highly accurate time signal. To give you the 1-minute intervals, the pulse is omitted on the 59th second of each minute.

On each hour and on each five minutes after the hour, the two audio frequencies are interrupted for exactly one minute for station announcement and to provide an interval of checking against the pure carrier in the absence of modulation. The announcement is made by signing the station call letters, WWV, in the International Morse Code, except that a detailed voice announcement is made at the hour and half-hour. These interruptions of modulation furnish an additional standard-time check, since their beginnings are synchronized with the time signals of the U.S. Naval Observatory.

The accuracy of each of the radio and audio frequencies transmitted by WWV is better than 1 part in 10 million. Accuracy of the time interval marked each second by the pulse is to 10 microseconds, and accuracy of the 1-, 4-, and 5-minute intervals, which are synchronized with the seconds pulse and marked by the beginning and ending of the intervals of interrupted modulation, is 1 part in 10 million.

STANDARD FREQUENCY RECEPTION:

The type of receiver to be employed for picking up WWV emissions will depend upon the frequency chosen, closeness of indications desired, and distance from Washington, D.C. Depending upon the daytime effect upon the carrier frequencies, any short-wave or all wave receiver will be capable of receiving one or more of the standard-frequency transmissions. For best results, however, a communication-type superheterodyne is recommended and this receiver should be equipped with automatic volume control and a crystal filter. This receiver

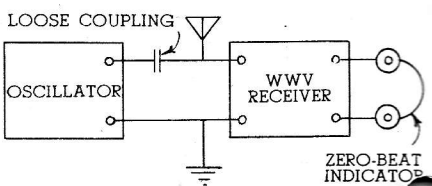


Fig. 1

is to be referred to as "WWV Receiver". Diversity reception will probably be found invaluable in localities where severe fading is experienced. Tone-control systems should be switched off during reception of the standard frequencies.

METHODS OF REFERENCE:

Both the radio- and audio-frequency emissions from WWV may be used for standardizing purposes. Practical methods for comparing local frequencies to the standard signals are as follows:

Comparison of low-frequency R.F. Oscillators: This is the most common application of the standard frequencies and refers to the standardization of radio frequency oscillators operated at the same or a lower frequency than that of the standard signal. Such equipment includes *frequency standards* (which are generally operated at fundamental frequencies of 100, 250, 500, or 1000 kc. etc.) *signal generators*, and *test oscillators*. These devices may be loosely-coupled directly to the WWV receiver, as shown in Figure 1, through a small capacitor, or by linking the insulated output lead (from the oscillator) about the antenna post of the receiver.

Tune-in sharply one of the WWV signals and for variable oscillators adjust the oscillator frequency control for exact zero beat. At zero beat with the modulated WWV signal, all roughness or waxing and waning will disappear. Closer zero beat adjustment may be obtained by beating with the pure carrier during the intervals when modulation is interrupted. A zero-beat indicator, such as an output a-c voltmeter, magic eye, or cathode ray tube, will give closer indications than will aural indicators, such as headphones or speaker. For fixed frequency Standards the frequency must be the same as, or a sub-multiple of, the WWV signal in order to use this method.

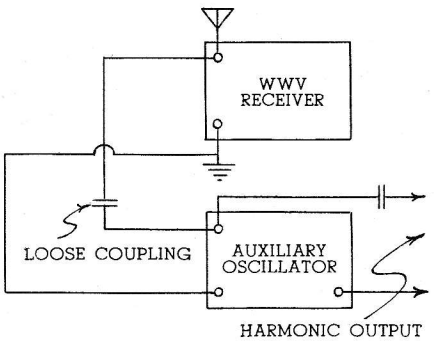


Fig. 2

Various methods are available for correcting the oscillator frequency. In self-excited oscillators a small trimmer capacitor, connected in parallel with the tank, serves this purpose. In crystal oscillators, a small trimmer may be connected in parallel with the crystal holder, a small padder capacitor in series, or the air gap between the quartz plate and the upper electrode may be made adjustable. A final close correction may be made by adjusting the crystal temperature, when oven-mounting is employed.

Extension of Frequency Range: Frequencies which are higher in value than either of the standard frequencies may not be checked in either of the manners described. A special set-up for extending the range of measurement is shown in Figure 2.

An auxiliary oscillator is operated at one of the standard frequencies and is corrected precisely. Its output will then contain the fundamental and harmonics of this standard emission to a high order. A 1000 Kc Standard can be used in the same manner. (Calibrator Ferris No. 33 Harmonic Content to 40th). The harmonic points may be employed for calibrating receivers, monitors, and other equipment embracing signal detection.

Non-detecting equipment, such as oscillators, signal generators, and wavemeters operated at higher points than the standard signals, will require a somewhat different arrangement.

As in the previous case, an auxiliary oscillator which has been calibrated as above, in addition to being loosely coupled to the WWV receiver, is loosely coupled to an aperiodic detector, a second receiver of the High Frequency range received.

The high-frequency oscillator under test is also loosely-coupled to the H.F. receiver detector and its output accordingly may beat against one of the harmonics delivered by oscillator. If the WWV receiver is of the required range it may be used in a dual role by carrying out the tests in sequence.

Radio-Frequency Deviation: In some cases, it is not possible or desirable to correct the frequency of an oscillator under test. This oscillator may be operated in any

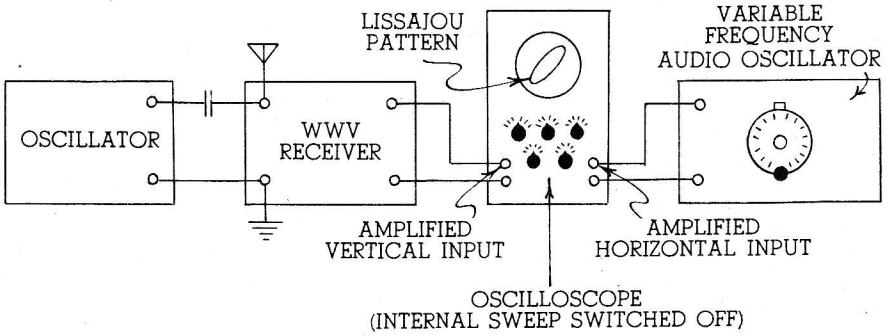


Fig. 3

of the conditions discussed in the preceding cases, and one of its harmonics may fall close to (but not coincide with) a standard frequency signal. If the deviation from the standard frequency is not more than a few kilocycles plus or minus, it may be measured by means of the arrangement shown in Figure 3.

Interaction of the two a.f. voltages will produce a typical set of patterns on the oscilloscope screen. When the frequency of the a.f. oscillator is adjusted exactly to that of the beat note between the r.f. oscillator under test and the standard frequency signal, the oscilloscope pattern will become a *stationary* circle or ellipse. At that point, the deviation frequency may be read directly from the dial of the a.f. oscillator. To determine whether the r.f. oscillator frequency is higher or lower than the standard frequency (plus or minus deviation), it is necessary only to remove the antenna connection (but not the oscillator coupling) from the receiver, to interrupt the standard frequency and note the dial position of the oscillator signal with respect to the WWV signal. This measurement is to be carried out during the intervals when the WWV signal is unmodulated.

Deviation measurements may be made, in a similar manner, upon high-frequency signals by a variation of the arrangement shown in Figure 2. In this case, the problem is to measure deviation of the unit under test from some harmonic of the auxiliary oscillator.

Audio Frequency Comparisons: Local audio frequencies may be referred directly to the tone modulation of WWV signals by means of the simple arrangement shown in Figure 4. The a.f. output voltage from the WWV receiver is delivered to the amplified vertical input of a cathode ray oscilloscope; a.f. output voltage from the audio oscillator under test to the amplified horizontal input. Sweep and synchronization within the oscilloscope are switched off.

If comparisons are to be made against the 440-cycle frequency, the standard signal is tuned in normally. If the 4000-cycle frequency is required, however, the receiver is detuned somewhat, as this higher tone will be found in the sidebands.

When the local a.f. oscillator frequency coincides with 440 or 4000 cycles, the oscilloscope pattern will be a stationary circle or ellipse. Harmonics or subfundamentals of the two modulation frequencies may be identified by means of Lissajou's Figures. A wide assortment of audio-frequency tests is thus afforded.

Comparison of Non-Coincident Frequencies: Radio frequencies which do not coincide with the standard frequencies, either in fundamental or harmonics, may be checked by means of a receiver or monitor which has previously been standardized against WWV.

For example, the receiver or monitor dial may be calibrated at a multiplicity of points by means of a low-frequency standard oscillator (operated at 50, 100, 500 or 1000 kilocycles) which has previously been standardized against WWV. The unknown signal is then tuned-in on the receiver and the position of the signal noted with reference to adjacent harmonics from the standard oscillator. The unknown frequency may then be determined either in terms of a beat note with one of the harmonics or by interpolation on the receiver dial.

Checking the crystal calibration of the Wavemeter TE-149 is a suitable example of accurate frequency measurements in R.C.E.-M.E. Workshops: Tune a suitable receiver to 5 megacycles until station WWV is heard clearly and couple the antenna lead to the TE-149 (loose coupling to the R.F. output). Detune the variable oscillator to eliminate any effect of harmonics. Switch to calibrate and listen for zero beat from the receiver. If zero beat is not obtained the cover must be removed, the trimmer condenser across the crystal adjusted slightly and the cover replaced. It will probably be necessary to repeat this operation a few times until zero beat is obtained as removing the cover has a slight effect on the frequency of crystal oscillation. Thus the use of elaborate frequency standards in the North American Area can be avoided. A wavemeter is calibrated by WWV and in turn the signal generators receivers etc. can all be calibrated to the required accuracy. You can now go back to your day dreams and your glass of beer.

x y z

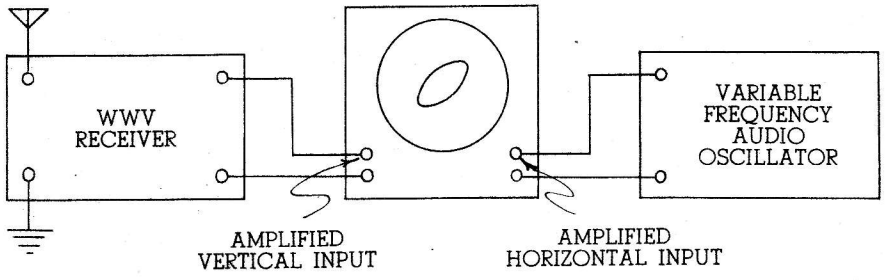


Fig. 4

THERE'S jolts behind those volts, eh Benny? Particularly when you get so wrapped up in your work that you become part of it—part of a high tension circuit fr'instance. Yeah—when it comes to fiddlin' with the high voltage that some of these sets pack . . . better you should stand well back in the crowd.

Of course you wouldn't know about the "one hand behind your back" technique. It's a little golden rule that Tels Mechs learn early in the game.

Still, look't the kick you got in finding it out!

Interesting Figures on

YOU wouldn't see a fireman trying to put out a fire with a garden hose—nor are you likely to see a gardener watering his pet Petunias with a fireman's hose. In both cases the hose used is designed to carry enough water—but not too much for the job.

The size of copper wire in electrical wiring has to be the right size for the job too. It would be silly to use ignition wire in place of battery cables for example, because the ignition wire hasn't enough current carrying capacity to supply the current required for starter motor operation. It would be just as ridic from the standpoint of cost to use heavy battery cables throughout the entire electrical system on a vehicle.

Resistance to the flow of current in a conductor is like the resistance to the flow of water in a pipe. The smaller the pipe—the less water will flow through it. The same thing applies in electricity. The amount of current flowing through a conductor depends on two things. First it depends on the voltage, which is the pressure and secondly, it depends on the resistance. The idea then is to keep the resistance to a minimum because the more resistance there is, the more voltage wastage (called voltage drop) there is.

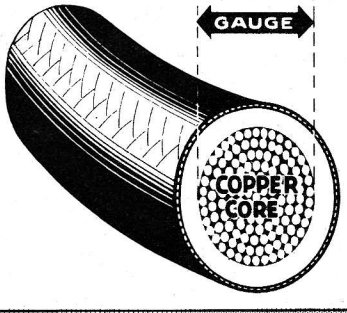


Fig. 1. From the insulation size you can't tell from nuthin'—it's the *cross-sectional area* of the copper core that counts.

But all wire has some resistance. Copper wire is most widely used because of its low resistance and relatively low cost.

Selecting a wire size just by guesswork is bad business. The size of wire or cable is called its gauge. The gauge number represents the cross-sectional area of the copper in its core as shown in Fig. 1. The larger the gauge number—the smaller the wire. In other words the **smaller the gauge number the less resistance** and the greater will be its current carrying capacity.

Battery cables are usually No. 1 or No. 0 gauge while the wire used between the generator and battery is usually No. 8, 10 or 12. Quite often someone will install new wiring between the generator and battery and by mistake they will use No. 14 or No. 16 gauge. This results in excessive resistance in that particular circuit and has a tendency to starve the battery and overwork the voltage regulator and generator.

The resistance of a conductor depends on something else besides its *length, cross-sectional area* and *material.* Its resistance also depends on its *temperature.* The cooler the wire the less resistance it will have. When current is passed through a conductor the temperature of the conductor will increase. This can be a good thing, otherwise we wouldn't have toasters, electric stoves and many other electrical devices. This feature is not so good, however, in some parts of electrical wiring —such as the charging circuit on a vehicle where the resistance should be kept at a minimum.

Number 18 gauge copper wire will safely carry 5 amps but 82 amps passing through the same wire would melt it. Number 14 gauge copper wire—having a larger cross-sectional area, will carry 20 amps safely and it'll take 114 amps to melt it. No. 10 copper wire, being still larger, will carry 30 amps safely but 330 amps passing through it will cause it to melt.

The size of round wire is measured by what is known as circular mils. This is a more convenient method than using fractions of an inch. One mil is 1/1000 part of an inch or .001". The cross-sectional area of a wire in circular mils is its diameter multiplied by itself. For example if a wire measured .005" with a micrometer it would have a diameter of 5 mils. Its circular mil area would be 5 x 5 = 25 circular mils.

Some wires consist of many strands of fine wire. The reason for this is to make them flexible so they won't break due to vibration. Nearly all wiring used in automotive work is stranded cable.

To measure the cross-sectional area of stranded cable in circular mils you'll have to measure the diameter of one strand—then multiply the circular-mil area of the one strand by the total number of strands. Example—

If one strand of wire measures .010" it would be 10 mils in diameter.

Its cross-sectional area in circular mils would be: 10 x 10 = 100 cir. mils.

Look at the table and you'll find this to be No. 30 gauge. If the cable consists of 19 strands of

(Continued on page 132)

Bare COPPER WIRE

Giving measurements at 68° F. (20°C) with specific Gravity of 8.89

(Brown & Sharpe)

A.W.G. and B & S Gauge	Diameter in Inches	Area Circular Mils	Weight Pounds per 1000 feet	Length feet per Pound	RESISTANCE	
					Ohms per 1000 Feet	Ohms per Pound
0000	0.4600	211,600.	640.5	1.561	0.04901	0.00007652
000	0.4096	167,800.	507.9	1.969	0.06180	0.0001217
00	0.3648	133,100.	402.8	2.483	0.07793	0.0001935
0	0.3249	105,500.	319.5	3.130	0.09827	0.0003076
1	0.2893	83,690.	253.3	3.948	0.1239	0.0004891
2	0.2576	66,370.	200.9	4.978	0.1563	0.0007778
3	0.2294	52,630.	159.3	6.276	0.1970	0.001237
4	0.2043	41,740.	126.4	7.911	0.2485	0.001966
5	0.1819	33,100.	100.2	9.980	0.3133	0.003127
6	0.1620	26,250.	79.46	12.58	0.3951	0.004972
7	0.1443	20,820.	63.02	15.87	0.4982	0.007905
8	0.1285	16,510.	49.98	20.01	0.6282	0.01257
9	0.1144	13,090.	39.63	25.23	0.7921	0.01999
10	0.1019	10,380.	31.43	31.82	0.9989	0.03178
11	0.09074	8,234.	24.92	40.13	1.260	0.05053
12	0.08081	6,530.	19.77	50.58	1.588	0.08035
13	0.07196	5,178.	15.68	63.77	2.003	0.1278
14	0.06408	4,107.	12.43	80.45	2.525	0.2032
15	0.05707	3,257.	9.858	101.4	3.184	0.3230
16	0.05082	2,583.	7.818	127.9	4.016	0.5136
17	0.04526	2,048.	6.200	161.3	5.064	0.8167
18	0.04030	1,624.	4.917	203.4	6.385	1.299
19	0.03589	1,288.	3.899	265.5	8.051	2.065
20	0.03196	1,022.	3.092	323.4	10.15	3.283
21	0.02846	810.1	2.452	407.8	12.80	5.221
22	0.02535	642.4	1.945	514.1	16.14	8.301
23	0.02257	509.5	1.542	648.5	20.36	13.20
24	0.02010	404.0	1.223	817.7	25.67	20.99
25	0.01790	320.4	0.9699	1,031.	32.37	33.37
26	0.01594	254.1	0.7692	1,300.	40.81	53.06
27	0.01420	201.5	0.6100	1,639.	51.47	84.37
28	0.01264	159.8	0.4837	2,067.	64.90	134.2
29	0.01126	126.7	0.3836	2,606.	81.83	213.3
30	0.01003	100.5	0.3042	3,287.	103.2	329.2
31	0.008928	79.70	0.2413	4,144.	130.1	539.3
32	0.007950	63.21	0.1913	5,227.	164.1	857.6
33	0.007080	50.13	0.1517	6,591.	206.9	1,364.
34	0.006305	39.75	0.1203	8,312.	260.9	2,168.
35	0.005615	31.52	0.09542	10,480.	329.0	3,448.
36	0.005000	25.00	0.07568	13,213.	414.8	5,482.
37	0.004453	19.83	0.0601	16,664.	523.1	8,717.
38	0.003965	15.72	0.04759	21,012.	659.6	13,860.
39	0.003531	12.47	0.03774	26,497.	831.8	22,040.
40	0.003145	9.888	0.02990	33,411.	1049.	35,040.
41	0.00275	7.5625	0.02289	43,700.	1370.	59,900.
42	0.00250	6.2500	0.01892	52,800.	1660.	87,700.
43	0.00225	5.0625	0.01532	65,300.	2050.	133,700.
44	0.00200	4.0000	0.01211	82,600.	2600.	214,000.
45	0.00175	3.0625	0.00927	107,900.	3390.	365,200.
46	0.00150	2.2500	0.00681	146,800.	4610.	676,800.

NOTE: *A mil is 1/1000 (one-thousandth) of an inch. Diameter in mils equals diameter in inches multiplied by 1000.*

ABOUT THE FIGURES* ABOVE . . .

THE above table applies to *bare* copper wire but the first three columns can be used to determine the gauge size of insulated stranded cable as used on vehicle wiring.

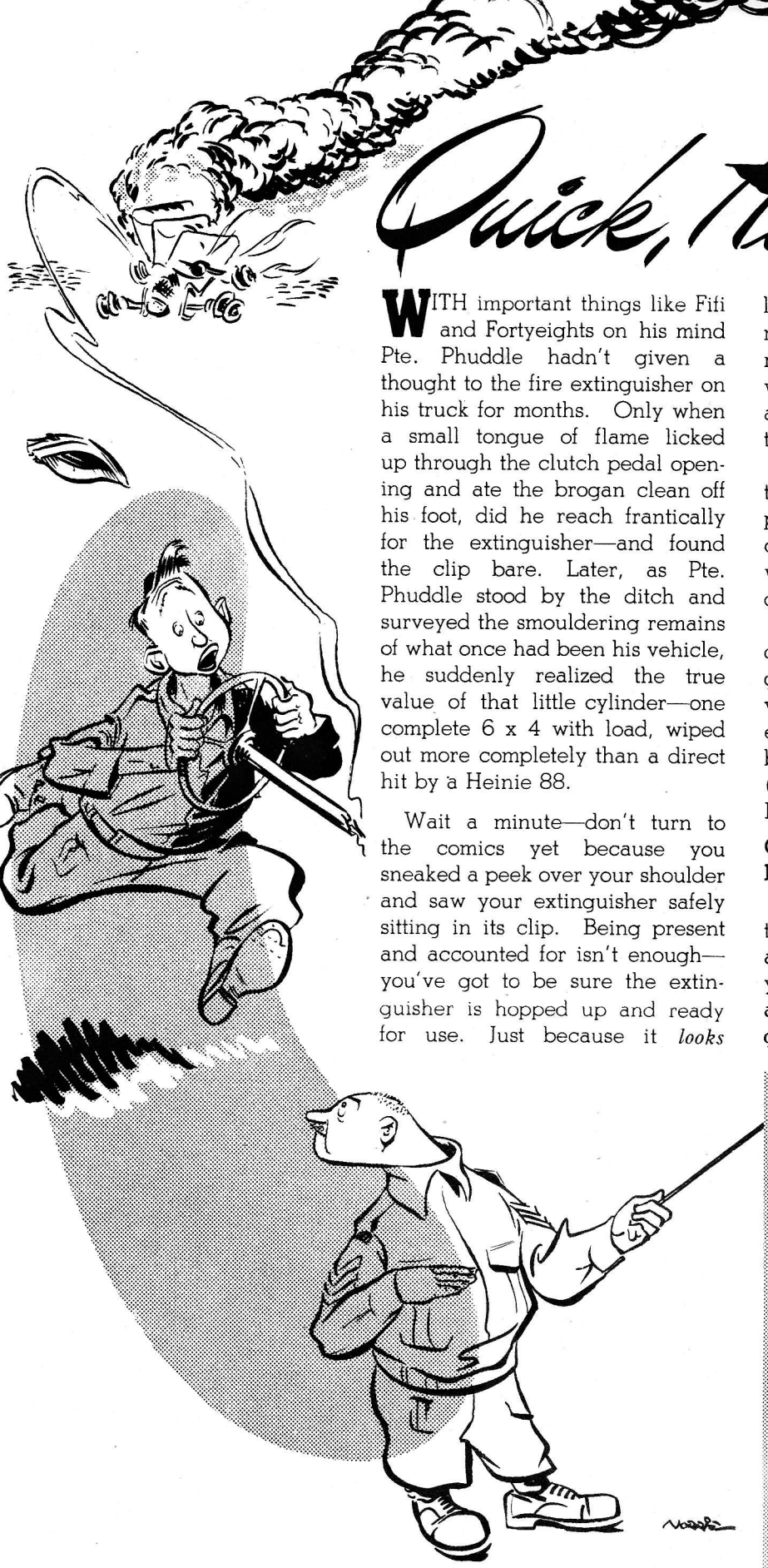
Most vehicle wiring comes in a wiring harness and very often it is easier and more economical to run one new wire outside the harness than to install a complete new harness. This method of repair is O.K., provided the vehicle is not radio equipped and provided the correct gauge wire is used.

The above table will help you to determine the wire gauge. Mike one strand of the damaged wire then find out its circular mil area by checking the table.

Next, multiply the circular mil area of one strand by the total number of strands. This will give you the total circular mil area and by referring to the table again you can find out what gauge wire you require.

**Uh - Uh - not those*

Quick, Henry, the E



WITH important things like Fifi and Fortyeights on his mind Pte. Phuddle hadn't given a thought to the fire extinguisher on his truck for months. Only when a small tongue of flame licked up through the clutch pedal opening and ate the brogan clean off his foot, did he reach frantically for the extinguisher—and found the clip bare. Later, as Pte. Phuddle stood by the ditch and surveyed the smouldering remains of what once had been his vehicle, he suddenly realized the true value of that little cylinder—one complete 6 x 4 with load, wiped out more completely than a direct hit by a Heinie 88.

Wait a minute—don't turn to the comics yet because you sneaked a peek over your shoulder and saw your extinguisher safely sitting in its clip. Being present and accounted for isn't enough—you've got to be sure the extinguisher is hopped up and ready for use. Just because it *looks* like a fire extinguisher doesn't mean a damn if it just emits a dry rattle when you need it. For when you need it, you need it bad and there's nothing in the world that'll take its place.

Regular Preventive Maintenance takes the sting out of this grim picture—plus a little know-how on operation. Both of these things will depend on the type of extinguisher you've got.

There are three basically different types of portable extinguishers that might be found on a vehicle. Blood-typed by their extinguishing agent they are Carbon Tetrachloride, Carbon Dioxide (often called CO2) and Methyl Bromide.

CARBON TETRACHLORIDE EXTINGUISHERS

To check for fullness, make sure the handle is in the locked position and shake the cylinder. When you shake, it must feel and sound absolutely full. These extinguishers can lose their fluid by

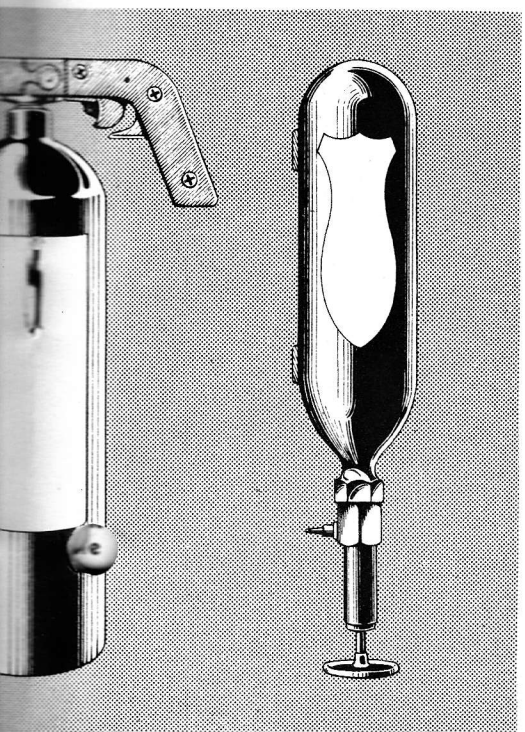
EXTINGUISHER!

evaporation and guys 'squirt testing' them.

It's also possible for the fluid in these extinguishers to become dirty—from oxygen or dampness sneaking inside and forming corrosion—so every CPMS 5, pump the fluid into a clean glass container for a check-up. If it is dirty, replace it with fresh fluid. Don't mistake the dye in the fluid for some sort of dirt or corrosive action. It's dolled up that way so that you don't use it for cleaning the gravy from your Sunday tie or the grease from coveralls—too many Joes were running around with spotless haberdashery and the fire protection of a fluidless extinguisher.

Never put water in the fire extinguishers. Moisture, even a little bit, will mix with the extinguisher fluid and cause hydrochloric fumes that'll corrode and damage the internal parts—and also render the liquid itself practically harmless to fire. It will also provide more fun than a picnic if you get an electrical fire. Replace dirty fluid and leave the extinguisher alone—don't try to clean its insides. You'll get the right juice for these babies by indenting to Spare Parts for (Refills, Fire Extinguishers 1 qt. Part No. 90527). These 1 qt. carbon-tet extinguishers (Fig. 1) are operated by a pump handle. First, release it from the locked position by turning it ¼ turn right or left—then pump away. The liquid will spray out on the up stroke *and* down stroke; the faster the pumping action, the farther the liquid squirts.

Immediately after use, refill the cylinder with the fire extinguisher liquid we've just told you about. You do this the same way for all carbon-tet type extinguishers. Here's how: remove the plug and gasket from the top of the extinguisher. Using a funnel, pour the liquid through the filler hole. Replace the gasket and plug and make sure they're tight. Then put the extinguisher back where you got it—it'll be there next time it's needed.



So that you can recognize at a glance what you've got when you grab the handiest extinguisher, here's a line up of type shapes for the three kinds we're talking about.

From left to right.

★ **Carbon Tetrachloride**—*made by several different manufacturers—but most likely you'll see 'Pyrene' on the name plate of yours.*

★ **Carbon Dioxide (CO 2)**—*In its small portable form it has the horn to give you a clue. You'll see 'Kidde-LUX' on its name plate.*

★ **Methyl Bromide**—*most likely 'DOMERCO' is the trade name visible—and this one has that upside down effect you'll readily recognize.*

CARBON DIOXIDE EXTINGUISHERS

These are found on tanks as built-in equipment, but may also appear as the portable Kidde-Lux job (in Fig. 2). Checking the charge of these is a bit more trouble than the carbon 'tet' type. It can only be done by *weighing the cylinders*—you won't get an accurate result with a pressure gauge.

On the Kidde-Lux extinguisher the *full weight* stamped on the valve *includes* the weight of the discharge horn. When you weigh this extinguisher and find a loss of weight more than 10% of rated capacity (the weight stamped on the valve)—replace the whole extinguisher.

You don't recharge Carbon dioxide extinguishers. All servicing and recharging of these extinguishers, as far as vehicles are concerned, is the worry of Ordnance. But they'll trade you a good one for that one you have now, if it's not up to snuffing—or has been used. (In the case of workshop and other such building fire extinguisher equipment, the R.C.E. take on the job of servicing and replacement as needed).

The Carbon dioxide extinguishers are easy to operate. When using a Kidde-Lux all you have to do is pull the trigger—like a gun—and the sealing wire will be automatically broken. Then keep the trigger pulled in and direct the spray with the discharge horn.

(Continued next page)

FIRE EXTINGUISHER—

(Continued from page 131)

One thing to watch. Don't touch the 'snow' that sprays from this extinguisher. It'll give you a sorta painful case of frost-bite.

METHYL BROMIDE EXTINGUISHERS

These are not so commonly seen as the other two types—but are nonetheless very effective and fast fire fizzlers.

Servicing is again governed by weight. You'll notice two weights marked on the cylinder. One is the weight of the cylinder and operating head when empty. The other, the weight of cylinder, operating head and full charge of Methyl Bromide. A variation from the full weight of more than 2 ozs. is a clue to the possibility of a leak having started. Screwing off the head and squirting a bit of light oil over the sealing disc will give you a check on this point.

While the head is off it's a good scheme to run a piece of wire through the nozzle to be sure it isn't blocked. Work the plunger a coupla times, while you're at it, to see that it moves freely and the spring is not corroded.

You operate this 'quisher with its head down, and start things going by striking the plunger on the ground or other suitable and handy solid object. This is a total discharge type and you've no handle to pump or trigger to trig. Just point the nozzle. After the smoke clears away—you immediately return the used extinguisher to Spare Parts and obtain a new one under Methyl Bromide Extinguisher 1-M-4.

Now that you've got your portable extinguisher in fighting shape, you've got to handle it right to quench a fire in the least possible time. Which is covered next month in chapter II of our red blooded serial entitled 'Who put the carbon-tet in Sgt. Murphy's chowder?".

x y z

COPPER WIRE (Continued from page 128)

No. 30 gauge wire you would multiply the circular mil area of one strand by the total number of strands—

100 x 19 = 1900 circular mils. Then by referring to the table again you will see that this cable would be between 7 and 8 gauge wire.

Don't let the fact that we used the odd number of 19 strands worry you. The fact is that in order to keep the stranded cables uniformly round the manufacturer has to use an odd number of strands. He can use 7, 19, 37, 61, 91 or 127 which makes it impossible to make stranded cable in exactly 7 and 8 gauge. In actual practice 19 strands of No. 30 wire would be called No. 8 gauge. In some cases, however—like generator lead wire, where very fine hair-like strands are used it is possible to make a round cable without sticking to the odd number of strands.

So that's the story of wire sizes and circular mils. Next time you go looking for No. 10 gauge wire you can find out all about it by referring to this table.

x y z

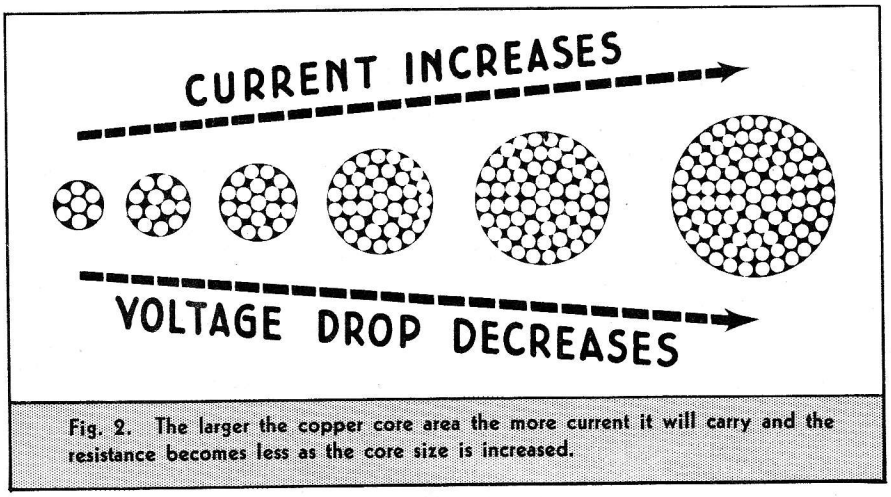


Fig. 2. The larger the copper core area the more current it will carry and the resistance becomes less as the core size is increased.

★ ★ ★ R.C.E.M.E. ★ ★ ★

I often used to wonder what RCEME really meant,
But now I've found that that's the place, where all our trucks are sent.
To be repaired by Engineers, nothing like our own.
Once they're out of RCEME, to the Dump they should be thrown.

Then there's the Ninety Day Inspection, by the R.C.E.M.E.
The Driving and the Office Staff are wild as they can be.
The Log Books and the vehicles are never up to par,
They seem to think that they're the worst they have seen by far.

Not only at the Maintenance that they must pick and tear,
But they move into the Office and get in the poor Clerk's hair.
They confiscate the typing machine as if it were their own,
And pounce upon the Log Books to make themselves at home.

We all agree the Clerk has done her very best,
But of course to Dear Old RCEME, the books are all a mess.
Her work and sweat and labour, it all has gone for naught,
For if she makes one small mistake, she sure as Hell gets caught.

Now take the Dear Staff Sergeant, he sure is quite the Guy,
He thinks the Girls come running, when e'er he winks his eye.
And then there is the Captain, some changes he must make.
And everything we're doing is for Dear Old RCEME's sake.

The trucks are checked by Sergeants from the R.C.E.M.E.
They call our trucks from Bedford or where ever they may be.
They go, both in and under, some small defects to find,
And pounce upon with rapture at faults of any kind.

There's no way to escape them, they're busy as the Bees,
Unless we all go Active and get sent Overseas.
And even then they follow to ruin our peace of mind,
Please God have mercy on our souls and save us from their kind.

Pte. Shirley Wilbur and
Pte. Anne Melynchuk.
No. 6 Coy. E. S. & W., RCE
Halifax, N.S., M.D. No. 6.

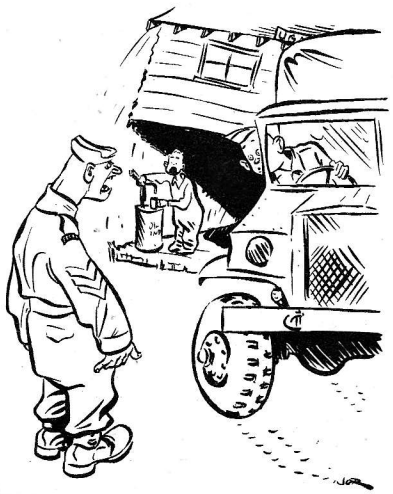
For B.F.s

BACKING UP . . .

IT'S safe to say, or we wouldn't stick out our neck saying it—that any fool can back up a truck. But that's as far as we'll go. What the driver's plans are (and we use the word loosely) on just where the truck goes is a question that has baffled the best brains in the country—including the B.F. behind the wheel.

However, the manufacturers *did* equip trucks with a reverse gear—so we may expect trucks to be backed up, through and over, a various assortment of miscellany such as hydraulic jacks, soldiers, air compressors, grease guns, the oil pan of the vehicle in the next stall and door jams.

While the cure is in the hands of the Gods—and certain well informed and red mustachioed N.C.O.s—the cause is simplicity itself. For the sake of argument let's say you are Simplicity Itself—behind the wheel. (You don't know us, so no harm can come of it). That's fine. Now 99% of the time you're driving frontwards. You can see where you're going and no one, not even the sarge, has a suspicion that you are a potential B.F. Then comes that 1% moment when you have to back the vehicle into stall number 4 of the Unit Garage. First thing you know you're into a jam. In fact the door jam has become a mere sliver of its former self.



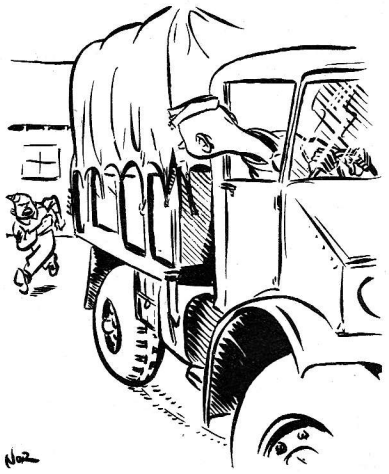
"First thing you know you're into a jam . . . ."

The sarge says things your mother never taught you and you pass an opinion on the sarge (mentally)—and try again, feeling sure in your own mind that there's a garage door *somewhere* behind you. Even if it isn't your lucky day you should find the opening on the fourth or fifth stab. The lucky try is recognized by a lack of sound such as splintering wood or crumpling metal—and a long drawn sigh from the sergeant.

Now there are those who regard backing up a truck in the same light as a game of "Postman's Knock"—it has to be done in the dark. And that's where we differ. Any joe who moves four to ten tons of ironmongery without knowing exactly where it's going, deserves what he gets. And he usually gets what he deserves.

If you're not sure just where you are, other than your postal address, stop, look—and *find out.* You should know to the nearest inch—even if it means getting off that nice soft seat and walking once round the truck—for luck.

As to the specific instance of backing through an open garage doorway, it's the approach that counts. Make sure you place your vehicle so that, during the whole reversing procedure, you can at all times *see* the doorway.



". . . . an interesting perspective of the side of your truck . . . ."

To do this you must be on the *inside* of the turning circle. This means that, on the usual *right* hand drive D.N.D. vehicle, your front wheels would be turned to the *right* when backing up.

We are amazed — and after reading this you can be too—at the number of B.F.s who do it the hard way. With your head peering out on the *outside* of the turning circle—you get an interesting perspective view of the side of your truck and no view whatever of the doorway you propose to enter. This may lead you to accuse the sarge of completely removing the door but he will invariably produce witnesses to show that (a) he did no such thing and (b) you owe the Canadian Government the sum of forty-nine dollars and nineteen cents to cover the cost of repairing one door jam, one set of sliding door guide rails and the repair and painting of one rear panel.

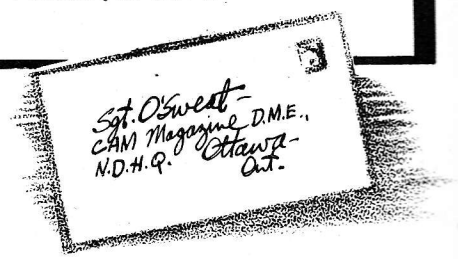
Take our word for it—all garage doorways are made wide enough for your vehicle to back through, so long as you can see exactly where they are. Using a vehicle to enlarge them to your own requirements is regarded as definitely 'not cricket.'

X Y Z

Sgt. O'Sweat's— HEADACHE & ASPIRIN Dept.

Whadd'ya know? Or to be more exact—whadd'ya don't know? That's what O'Sweat wants to know. Who's O'Sweat? He's that mechanical man—nature's gift to frantic mechanics. He has D.N.D. 365 running through his veins and slicks down his hair with gear lube.

If you've got worries, problems or headaches—all you gotta do is drop him a line. He'll knock himself out digging up an answer—and won't slip you the gears. Address your note to—



Running In An Engine

Dear O'Sweat:

While reading the Removal, Reconditioning, and Replacement Procedure of engine assemblies as laid down in the Canadian Army Local E.M.E. Instructions, I came upon the paragraph with the heading "Run in procedure" so I started to read it over again but it still said "Fill the crankcase and carburetor air cleaner with D.N.D. 365 oil".

Now as long as I can recall, ever since S.A.E. 10 oil was first introduced on the market all motor manufacturers have recommended its use in running in of new motors and as I have been instructed and as it is also quoted in RO 5069, 9 Nov 44, that D.N.D. 365 is equivalent to S.A.E. 30.

Would you kindly put me straight on this and probably ease the minds of many others why D.N.D. 365 is recommended.

S/M V.P.G.

Dear S/M V.P.G.:

That's a fair question if I ever saw one. Don't go to the eye specialist just yet though because you weren't seeing things when you read about running in engines on D.N.D. 365.

Tests have been under way for some time using D.N.D. 345 H.D. oil to determine its reaction during the running in period where engine temperatures are inclined to be above normal. Remember—D.N.D. 345 and 365 H.D. oils are not like the ordinary S.A.E. 10 or 30 oils available for civilian use. They contain a detergent which improves their cleansing ability—therefore their characteristics may differ slightly at **"above normal"** temperatures.

If tests prove that the lighter oil is O.K. for the running in period an amendment will no doubt be made to the C.A.L.E.M.E.I. you mention. In the meantime do what the army says—use D.N.D. 365 for running in engines.

O'Sweat

Spring Squeaks

Dear O'Sweat:

The vehicles in my charge are subject to dusty roads in summer and lots of snow in winter. My particular problem is how to eliminate the squeaks in both front and rear springs.

Any information on this will be greatly appreciated by my drivers and yours truly. Thank you, old boy. Your pages of info are always devoured first before reading the rest of CAM.

Sgt. C.O.B.

Dear Sgt. C.O.B.:

In other words Sarge—you want me to tell you how to stop spring squeaks without raising a squawk. That's what you'll get, you know, if you try lubricating truck springs—and the squawks from the higher ups will be louder than the squeaks. If you don't believe me look up C.A.L.E.M.E.I. Veh. Gen. A-261-CA.

The operation of leaf springs depends upon two factors. First the "springiness' of the metal in the leaves and second the "friction" between the leaves. If you spread oil between the leaves to get rid of squeaks you reduce the friction, which will result in bottoming due to too much "spring" or "bounce". This usually causes damage to other parts especially shock absorbers. In time it will give you a case of

flat springs—on a man this would be equivalent to flat feet.

The best cure (though it's not a nice job) is to remove the springs, separate the leaves and thoroughly clean the surface of each leaf with a wire brush. Reassemble them and the squeaks will be gone. If the springs in your trucks are squeaking badly—that's about your only solution. On passenger type vehicles, where the load is not so great, I think you're pretty safe in giving them a shot of lubrication only as often as is necessary. One way to do this is to lift the vehicle by jacking up the frame allowing the weight of the wheels and axle to pull the leaves apart. Then you can force spring lubricant between the leaves. D.N.D. 650 grease can be used on springs equipped with grease fittings (such as Ford passenger vehicles) but on open type springs where you may run into difficulty applying grease, use penetrating oil D.N.D. 325.

O'Sweat

More on Ford Brakes

Dear O'Sweat:

Ford Gun Tractor brakes often give us trouble because they are difficult to set properly. I have had experience with these vehicles in Canada and overseas but would like more information on their brakes.

Sgt. M.J.S.

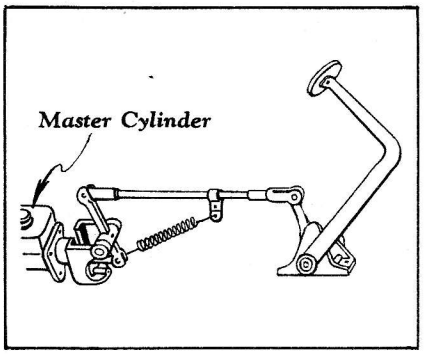
Dear Sgt. M.J.S.:

We've been kicking the subject of Ford brakes around for several months. It looks like a lot of the boys are having trouble getting away from a spongy pedal on these jobs—especially the older vehicles. It struck me that maybe that's the reason for your question.

These brakes were brought up the first time in December CAM—page 58. Then again in February CAM—page 98. Since then I've received another solution from Lieut. Whitehead of Camp Borden—and as it sounds like he might have something, here's the meaty part of his letter.

" . . . . Everything else in the braking system being normal, you sometimes find that after you have taken up one inch or so of slack and the rod is in contact with the piston in the master cylinder, the brakes are applied in the usual way—except that the pedal, (under a fair amount of pressure) is springy, but not spongy. This is caused by improper adjustment of the linkage between the pedal and master cylinder."

"Thinking back for a moment to the old mechanical brakes, particularly Ford, we remember that rods were adjusted so that the levers were just a little back of vertical. When the brakes were applied, the levers were pulled into an almost vertical position, thus giving the maximum amount of leverage. This avoided the springy pedal on the mechanical system."



"Applying this to the 40 and 41 D.N.D. 30 and 60 cwts we find that from the lever on the pedal shaft, a rod about three feet long goes to a second lever, which in turn has a short rod to the master cylinder.

"By adjusting the clevis on the long rod so that the levers are about an inch back of vertical, and compensating for the adjustment on the short rod so as to leave the proper amount of clearance before the piston on the master cylinder is engaged, you will find you have a much more solid pedal. (Don't swear at us, we didn't build the truck with the clevis in such a handy place)".

Thanks Lieut. for letting me know what you found—I hope your idea helps a lot of boys to get the bugs out of Ford brakes on their "oldish" vehicles and that it answers the Sarg's question.

O'Sweat

Altitude vs Carburetion

Dear O'Sweat:

We've had several arguments on a certain subject in our mess and so far no one has been able to settle the question to everyone's satisfaction. Maybe you can give us the dope so here's what it's all about.

Exactly how does altitude affect carburetion? Does the mixture become richer or leaner at high altitudes and are balanced carburetors and atmospheric type carburetors affected equally as much at great elevations.

Cpl. W.M.A.

Dear Cpl. W.M.A.:

Watcha gonna do Corp—fit wings on your Jeeps? Anyway here's how I got it figured out—and why.

Some people can't get away from the belief that the fuel mixture is sucked into the cylinder. However, you and I know that the air and gasoline is pushed into the cylinder by atmospheric pressure. Atmospheric pressure is caused by the weight of air above the surface of the earth—which naturally decreases as the altitude becomes greater. For example, at sea level the atmospheric pressure is about 15 pounds per square inch and at

the top of Pikes Peak which is 14,000 feet high, it is only about 8½ pounds per square inch.

Because the pressure in the carburetor air horn and the pressure inside the carburetor bowl decreases equally, one might think that the air fuel ratio remains the same at higher altitudes—but it doesn't. The reason it doesn't is because the air becomes thinner or rarer at high altitudes. In other words there is less oxygen per lungful of air—that's why airmen have to carry their own supply. At sea level, where the air is fairly dense due to its being compressed by its own weight, there is plenty of oxygen in every cubic foot of air. At the top of Pikes Peak there is only about 65% as much oxygen in the same cubic foot.

Because it's the oxygen in the air that supports combustion, you can see what will happen if the flow of gasoline through the jet remains the same and the quantity of oxygen available decreases. The mixture will become rich. To overcome this it is common practice to reduce the carburetor jet size slightly when an engine is operated at altitudes above 3,000 feet.

Frankly, I can't see why high altitude would affect a balanced carburetor any differently than it would affect an atmospheric type carburetor. In both cases there would be a reduction of pressure in the float chamber even though the balanced type takes its pressure from the **inside** of the air horn while the atmospheric type has its float chamber vented to the outside air. The pressure inside the float chamber on a balanced carburetor will always be **slightly** lower than on an atmospheric type regardless of elevation but the jet sizes are balanced to offset this difference.

O'Sweat

Ford Fuel Pump Push Rods

Dear O'Sweat:

On many occasions Ford fuel pump trouble is caused by the wearing of the push rod. This trouble may be remedied by several methods, one of which is to separate the rod and a shim installed, thus lengthening the rod.

Is this the recognized method of repair and if not, can you tell me what is?

Anonymous

Dear Anony

This doesn't look to be a serious problem from where I sit. These push rods ain't an expensive item and there doesn't seem to be any shortage of them. The easiest way out would be to install a new rod if the old one is worn.

The Army doesn't supply ready made shims for this job as far as I know but in a pinch I suppose you could make them.

However, if you are caught short sometime and can't get a new push rod you can always build up the old rod by brazing and then grind it off to its correct length. Be very careful not to make it too long as this would increase the stroke of the pump

O'Sweat

NO MORE EMER'S DILEMMAS

"E.M.E.R.S! C.A.L.E.M.E.Is!" snarls McFritty, "They gives me a pain! More red tape!—Never find the x:$%x$ one I want—! Whole biznis don't make sense!"

"Shsss" we say, "You'll wake baby—besides have y'ever studied GEN. A003?"

"There y'go—GEN. A003! Whatnells GEN. A003?"

Just like we thought—well perhaps we should tell you that unless you're acquainted with this A003—unless you get to know this A003 like you know the spots on those African cubes—you can't win.

The Brains behind EMER's think so much of their GEN. A003 that they're putting out the latest one on bright yellow paper—to try and attract your eye towards this important . . . but wait a minute—you asked what in (what you said) is GEN. A003?

GEN. A003 is C.A.L.E.M.E.I. GENERAL A003 (C.A.) It's a general description of the whole EMER set-up. It tells who makes 'em, who gets 'em, and what to do with 'em when you get 'em. (Which probably isn't what you have contemplated doing). In other words, GEN. A003 is the technical instruction on the EMER's themselves. Study it as you would any other technical instruction you receive.

All the content is important, but some of it we'll spot-light for you as being particularly important to the guy responsible for filing the instructions—and the guy responsible for doing the job.

Bear down, to start on the paras. (10 to 15) dealing with 'Layout', plus para. 16 which covers 'Categories'. The mysteries of 'sub numbering' are made duck soup in paras. 18 to 22.

This 'amendment' business is important and will assure that instructions which have been superseded are not cluttering up your folder—if you follow the rules in paras. 29-30.

That leaves little else but the actual filing of the instructions as they are received. The old gag about a place for everything and everything in its place is at the root of this whole system. Paras. 34 to 37 point out the way to this end.

Maybe all this sounds confusin'—it did to us too—but if you'll fish out that GEN. A003—browse over it carefully, with a binder of EMER's on hand, so that you can *see* the way all these things dovetail together, you'll gradually become aware of the downright slickness and efficiency of this indexing system.

After that, if you're still not crystal clear on this EMER story—**you know our address.** O'Sweat owes money to all the proper people, so they'll knock themselves out answering his questions.

X Y Z

Mama's Little Baby Loves—

SHORTENIN' BRAKE CABLES

. . . . that is—when the Jeep hand brake cable is stretched

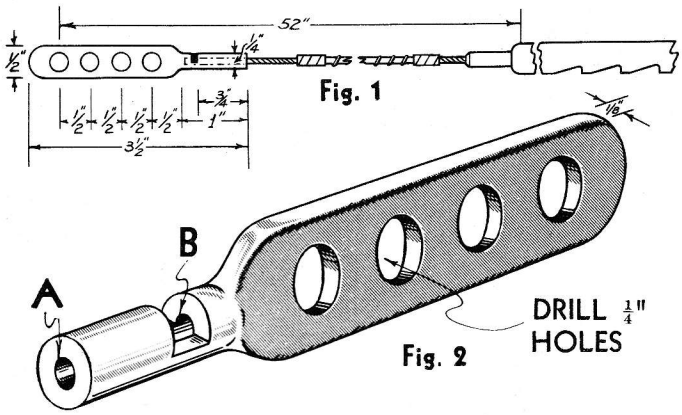


Fig. 1

Fig. 2

YOU know and we know that there's no more elastic in the Jeep hand brake cables than there is in your G.I. suspenders—nevertheless these stranded steel cables do stretch. When this happens you may find yourself at loose ends when you try to use the hand brake.

Along about the time the manufacturer installed crankcase ventilators on Ford and Willys Jeeps (in 1943) the type of transmission brakes were also changed from the external type to the internal type. This design change overcame the difficulty resulting from stretched cables. Jeeps which rolled off the production line *before* this change was made are liable to need a little cable shortenin' and you've probably found out before now that they haven't an adjustment.

C.A.L.E.M.E.I. Wheeled Vehicles W047 Inst. 4 which will hit the field shortly, tells you how to shorten these cables. In the meantime here's what it's all about.

Take a look in the vehicles log book. If it's a Ford Jeep and has an Engine Number lower than 193891 it'll have the old type external transmission brake. On Willys Jeeps the external type brake will be found on those which have a Serial number lower than 373337. Of course if you'd rather you can look at the brake itself. If it's the external type and the hand brake won't operate due to stretched cable—this is what you can do to shorten it.

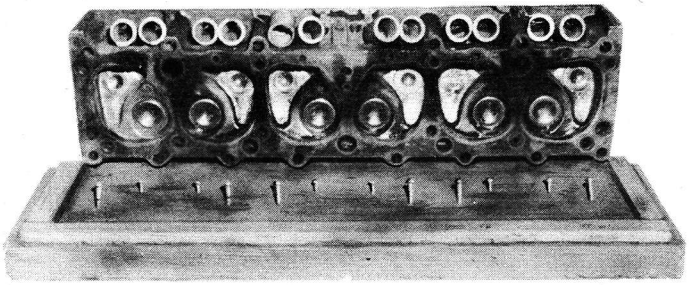
Get yourself a piece of cold rolled or mild steel 3/8" thick and 3½" long. Then make up a cable end like the one shown in Fig. 2. The hole shown at 'A' is .086" in diameter and can be made with a No. 46 drill, then cut a slot as shown at 'B' in the same picture.

Next shorten the original cable end by cutting the cable wherever necessary to leave you with an overall length of 52". This is shown in Fig. 1.

All there is left to do now is insert the cable into the new cable end you have made and braze it into place at slot 'B' Fig. 2. When installing the cable on the vehicle, you should be able to place the clevis pin in the last hole.

x y z

Valve Assembly Jig



♫ **HAND** happy, hand happy, hand happy now. ♫ That's what the boys sing in No. 3 Coy. R.C.E.M.E. Workshop at Kingston—and the kind of soap they're using has nothing to do with it.

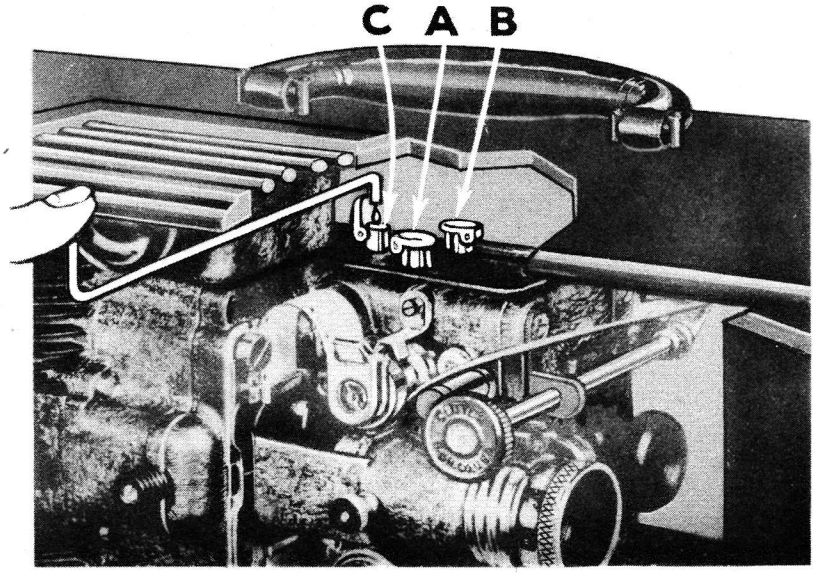
The gimmick in the picture, according to Sgt. Samis, is one way to simplify the job of installing valve locks, etc. on a Chev. head and at the same time eliminate the hazard of busting knuckles.

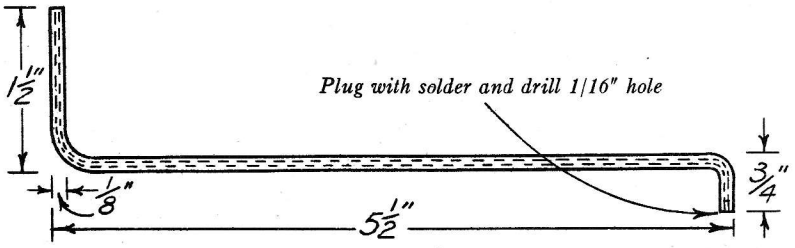
It's easy to see how, by laying the Chev. head on the wooden block so that the valves are held in position by the twelve correctly positioned screws, the valve springs can be compressed and their keepers installed quite simply with a saving in time and energy.

In our opinion this is another one of those useful and simple home-made tools that help make maintenance easier.

x y z

DOUBLE EXPOSURE ON PROJECTORS





WHEN we heard how many projectors were coming into Wireless Workshops for repairs we didn't believe it. These conveyors of Bugs Bunny, SNAFU and the like just don't stop flickering without reason. A big reason for their failure seems to be oil trouble. Not too little, as one might suspect—but too much.

Overoiling the Bell and Howell projector results in slipping clutch plus oil smeared all over the film and lenses. When this happens the unit must be sent to the workshop for stripping and cleaning.

There's three oil cups on the B and H machine. 'B' and 'C' (Fig. 1) only require *one drop* of oil after *every sixteen* hours of operation, oil cup 'A' should be fed *one drop* after *every four* hours of operation. This is the correct dose—no more—no less. And don't forget to record your lube job in the log book so that your side kick doesn't repeat the treatment.

Because these oil cups are in an unhandy spot, here's a little idea that may help you to make sure only one drop gets in the oiler at each lube job. Scrounge eight inches of 1/8" copper tubing from an M.T. shop and bend it so it looks like the one we show here. Plug one end with solder, then drill a 1/16" hole through the solder.

To use this piece of tube instead of an oil can, wipe the outside of tube clean, dip the soldered end in the oil bottle, then place your thumb over the top end and you'll trap a quantity of oil in the tube. Wipe the excess oil from the outside of the tube, then ease up with your thumb on the top end and a drop of oil will form at the soldered end. Aim so it will drop into the correct oil cup and the problem becomes no problem at all.

Some projection equipment is still coming in for repairs in a filthy condition and this shouldn't be. These machines must be kept spick and span or the film life will be reduced. Carbon tet can be used not only for films but for all the film handling parts, sprocket teeth, pressure plate, aperture plate etc.

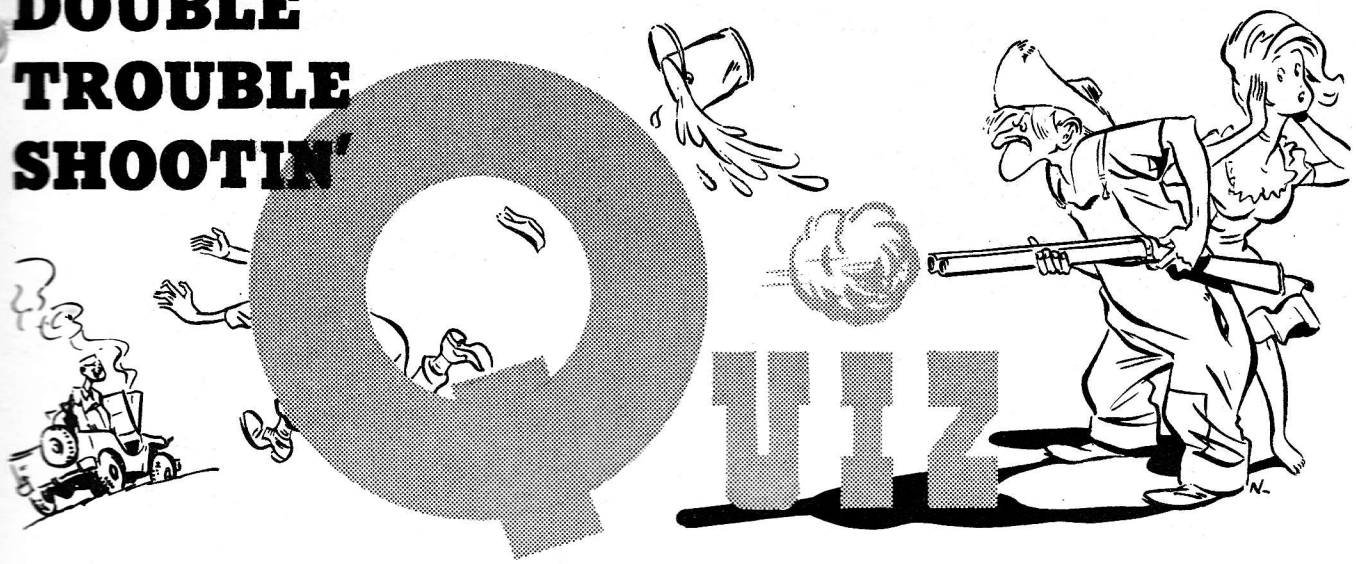
So there's two things you can do to make a lot of people happier if you're a projectionist. Don't be a squirt with an oil can and keep your equipment clean.

x y z

Embarrassing Question?

D'you carry accident report forms and witness cards in with your standing orders? They're a great help in getting all the answers to all the questions you'll be asked if you have an accident.

DOUBLE TROUBLE SHOOTIN' QUIZ



1. No good will come of connecting a condenser to the field terminal of a generator—in fact it will be very hard on . . . .

2. Then there's the guy who will clamp a Chevy distributor in a vise making burrs on the lower part of the housing. This plays havoc with the operation of the . . . .

3. To adjust the idle you first adjust the throttle to the correct speed—then you adjust the idle needle which upsets the speed. So you readjust the speed which upsets the mixture (maddening isn't it). But which adjustment should you finish up with?

4. We have heard of all kinds of trouble shooters who will clean and adjust distributor contact points and then neglect to alter the spark timing. If the contact gap is widened it will . . . . the spark timing.

5. Setting the distributor contact gap wider than the manufacturer says will result in too little cam angle. This will result in a weak spark—especially at . . . . speed.

6. Only one set of points in a Ford distributor breaks the circuit and causes the spark to occur. If this set of points doesn't make contact (due to dirt or oil)—the other set may operate the coil but the spark timing will be haywire and may cause . . . .

7. Uncle Ampere needed a coil for a six volt system but all he had was a 12 volt coil. The question is—could he use a 12 volt coil on a 6 volt system?

8. Then there was his daughter—High Resistance who said that low electrolyte level in batteries played hell with voltage regulators. D'ya think she knows what she's talking about?

SHOOT THE PAGE AROUND FOR THE ANSWERS ▶

1. The contacts in the regulator will arc excessively if a condenser is connected to the field terminal of the generator. That's why radio condensers are always connected to the "armature" terminal of the generator—not the field terminal.

2. The vacuumatic advance and retard will be effected. Some distributor housings must turn freely in the block when the vacuum control operates. Burrs on the lower part of the housing prevent this free movement.

3. Finish up with the mixture adjustment and if possible use a vacuum gauge. Adjust the idle adjusting needle to obtain the highest and steadiest reading on the gauge with the engine running at its proper idling speed.

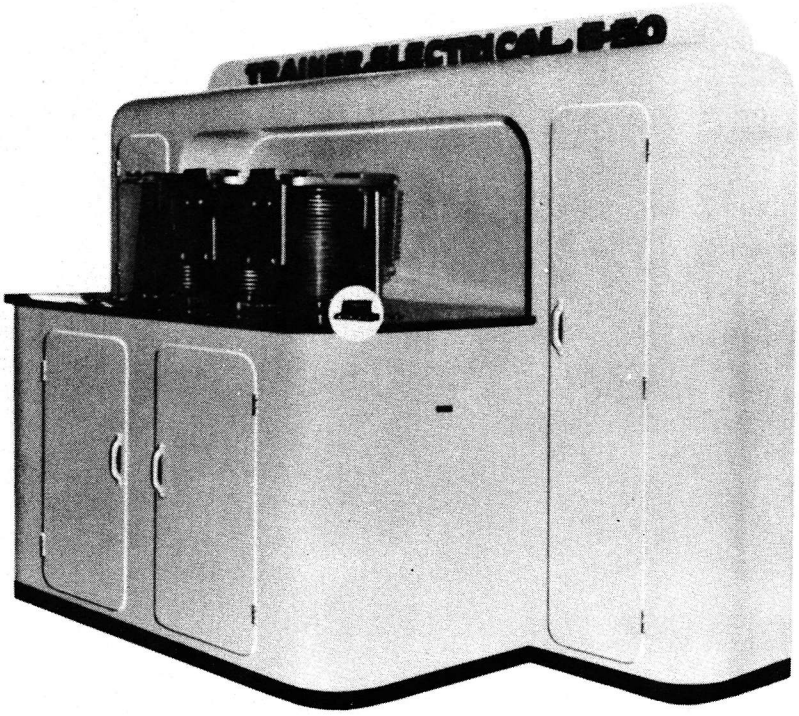
4. Advance is the word you're looking for. When the contact gap is widened the contacts separate sooner which naturally makes the spark occur earlier.

5. High speed ignition miss is often caused by too wide point spacing. To obtain a strong, hot spark at high speed you've got to have correct contact spacing (Cam Angle).

6. Detonation (or pinging if you like). The point is this—if the spark occurs when the first set of contacts separate the spark will occur much too soon—giving you a bad case of advanced timing.

7. Of course he couldn't use a 12 volt coil on a 6 volt system. Six volts won't push enough current through the winding of a 12 volt coil—the resistance of the winding is too great.

8. But daughter knew what the score was. Low electrolyte causes sulphated plates and high voltage. The voltage regulator works overtime to keep the voltage down and before you know it the regulator points are shot.



The boys stop, look and listen at this magnified model regulator that tells all in a big way. Lamp the comparative size of the real regulator in the insert.

ROLL YOUR EYES OVER THIS

REGULATOR TRAINER

NO, you're not seeing things—it really is a voltage regulator unit, complete in every detail. In our opinion it's an instructor's dream come true and it took the boys at A-21 Barriefield Automotive School to dream it up.

It seems they believe down there that 95 per cent of knowledge enters the head through the eyes—the remaining 5 per cent through the ear. Having this thought in mind they built a working model of a Delco-Remy generator control unit large enough for even Benny Boob to see its working principles.

Actually it is hydraulically operated and duplicates mechanically the electrical action that takes place in an ordinary regulator.

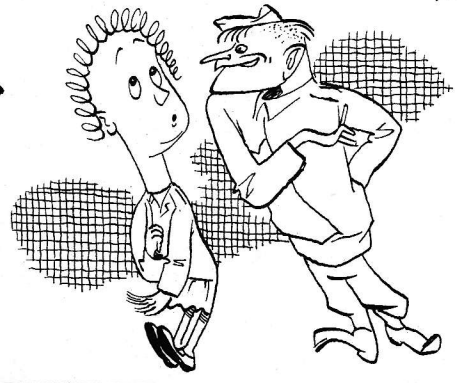
Transparent plastic tubing of sizes representing both current and voltage windings carry moving oil and air bubbles. These clearly show the circuits and direction of flow in the reverse current relay, the current regulating unit and the voltage control unit.

Vibrating armatures, reverse current action of the cut-out relay and the paths of the field current to ground through the control unit points and resistors are all visible. All you've got to do is follow the oil and air bubble movement to trace the circuit and see exactly what is happening.

Current and voltage regulation are followed through three phases of battery condition; the dead battery, the half charged condition and the fully charged state. These changes take place automatically and in slow motion. Instead of the armature vibrating at about 250 times per second it is slowed down to 1 per second. This makes the study of the regulator about as simple to understand as the weekly funnies.

Nice going, A-21—it just goes to prove that the Army schools of instruction don't need to take a back seat to anyone.

x y z



People keep tryin' to get personal . . .

. . . . personal subscriptions to CAM we mean. And we gotta keep saying "Sorry—we cawn't do it." Sure, we'd like to have a personal mailing list a mile long with two Beautiful Blonde C.W.A.C.'s to look after it. Instead CAM is for Free—and we haven't the two Beautiful Blonde C.W.A.C.'s.

What actually happens is this. We print so many magazines each month. These go out in one big package to each District or Command H.Q. There they are shared out among the Units.

When a CAM gets to the Unit, the first character that grabs one hasn't the right to regard it as his'n. Everybody in the outfit is entitled to take a read at it. So, if you don't see it—ask your senior N.C.O. If we know our senior N.C.O. he'll do his darndest to get it to you.

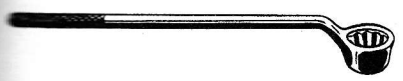
But personal subscriptions! doggone, we're willin' but not able!

Tickle the Sarge by knowing your tools

YOU should — because it's no accident that there's a flock of special odd looking tools in your tool crib. The army put those tools there to make your miserable life happy.

Blundering about with the wrong tools just makes you say things you wouldn't want your Mother to hear—besides causing all kinds of destruction.

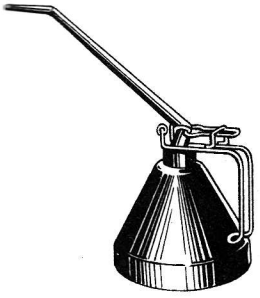
Here are a few that the army provides to help you better the maintenance on your equipment. Don't pass them up—pass them out—and put them into service.



Wrenches, brake cam adjusting, Part No. C-527. This is a special tool for adjusting Chrysler brakes. Note the taper on the outside of the head. That's what makes it easier to use than an ordinary open end or box wrench. It gets right in there and grips the cam.

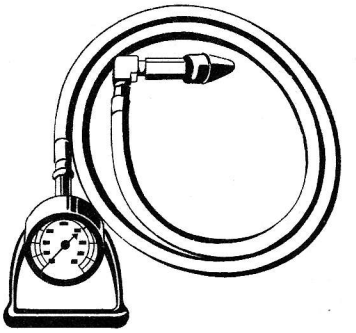
Pliers, brake spring, Part No. S-31. Did'ya ever get hung up on a brake shoe spring with the fleshy part of your hand? If you did, it's a pretty sure bet you weren't using this set of special pliers. Never use ordinary pliers—it's dangerous. Never use a screw-driver for the job—it will usually bend or break.

Filler, brake master cylinder Part No. X-3833A—if you don't use this glass jar and trick spout you're sticking your chin out. It fills the cylinder to the correct level automatically, keeps the fluid clean, prevents waste of precious fluid and is a cinch to use.



Filler, shock absorber, Part No. 3A. Maybe it's no stranger to you—it shouldn't be because how else can you fill shocks? The reason we stuck it in here is to remind certain slap happy characters that this can should never be used for anything else but shock oil. You might find the same individuals carrying gasoline in their water bottles—who knows?

Goggles — Part No. 90181. Don't bother with them if you are not interested in protecting your eyesight. However—if you want to enjoy standing on a street corner and whistling when you're ripe and old—always wear goggles while you're welding, black-smithing, chiseling or bench grinding.



Gauge, compression, Part No. KMO-213. Nearly everybody has seen the compression gauge but many are afraid to use it. Step up like a wolf and get familiar with it—testing engine compression is important.

Note: If yours hasn't got the extension hose—you can indent through Spare Parts for Hose extension, complete with fittings, for gauge compression.

DOPE FIENDS

WHEN a certain bronze bearing persists in seizing on your pet vehicle, what d'you do? Spend the best days of your life replacing it every time it goes?

In a pig's ear!

You find the *cause* and mebbe work out the *cure.* Which is swell—then, do you make out a Defect Report?

"Well", you say, "we been kinda busy lately . . . "

Meanwhile, all up and down de whole creation, these little bearings have been seizing up on other guys. Some have figgered a fix—lots more haven't—and back at H.Q. somebody orders another million of these *faulty bushings* to supply the demand.

Don't make sense does it? Yet who's to know about these defects if you don't tell.

No one knows better than the Army that equipment can have defects. That's why the M.F.M. 211 (Design Defect Field Report Form) was born—to bring them to light and enable the cure to be passed on for the benefit of the rest of the boys. Instead, alla-time we hear rumours of equipment defects and ideas for overcoming them —ideas that end up gathering fly specks in a corner of some guy's brain because he doesn't know enough, or bother enough, to report them properly.

You get the pernt—so unwrap that dusty bundle of 211s and put them to work.

LEAVE US HAVE OUR DOPE!